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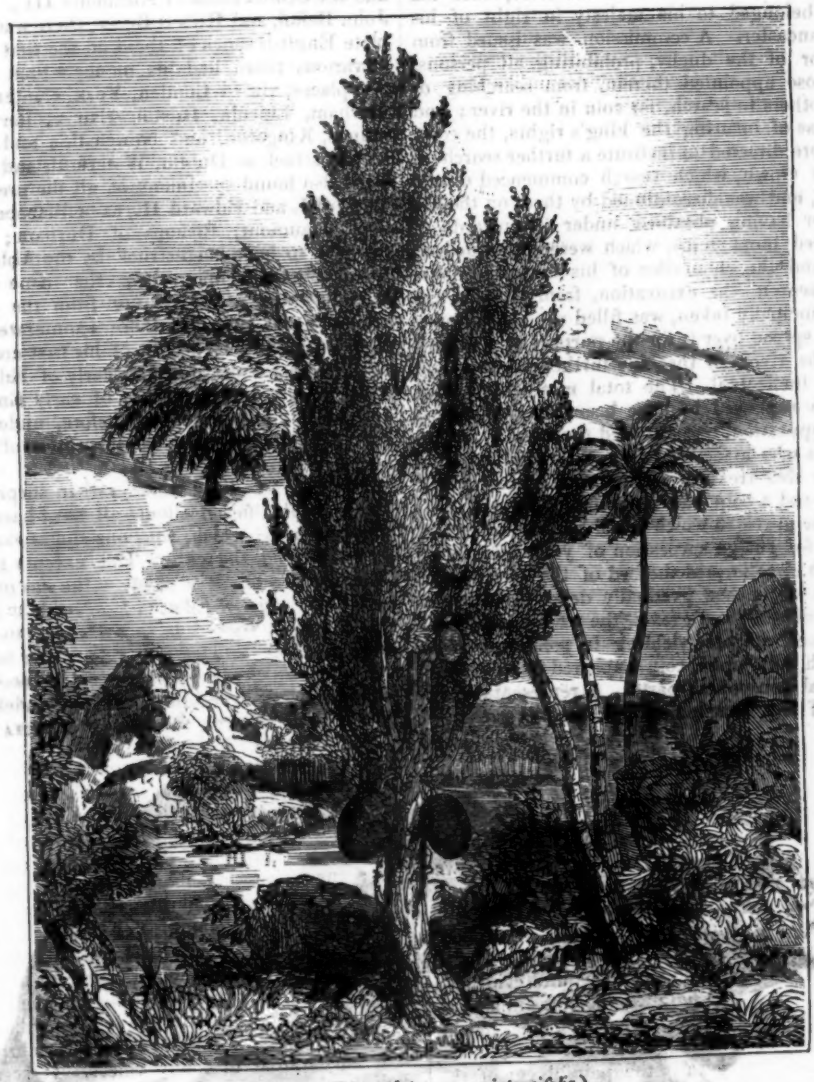
THE JACA-TREE.



The Jaca-Tree.—(*Artocarpus integrifolia.*)

THE volume on 'Timber Trees and Fruits,' in the 'Library of Entertaining Knowledge,' supplied to No. 41 of the 'Penny Magazine' an account of the bread-fruit; and in now presenting our readers with another species of the same tree, we shall recur to the same source for such information concerning both species as the former article does not supply.

The bread-fruit tree, originally found in the south-eastern parts of Asia, and the islands of the Pacific, though now introduced into the tropical parts of the western continent, and the West India Islands, is one of the most interesting as well as singular productions of the vegetable kingdom. There are two species of it:—the bread-fruit, properly so called (*Artocarpus incisa*), with the leaves deeply gashed, or divided at the sides, which grows chiefly in the islands;—and the jack-fruit, or Jaca-tree (*Artocarpus integrifolia*), which grows chiefly in the main land of Asia.

The bread-fruit is a beautiful as well as a useful tree: the trunk rises to the height of about forty feet, and, in a full-grown tree, is from a foot to fifteen inches in diameter; the bark is ash-coloured, full of little chinks, and covered by small knobs; the inner bark is fibrous, and used in the manufacture of a sort of cloth; and the wood is smooth, soft, and of a yellow colour. The branches come out in a horizontal manner, the lowest ones about ten or twelve feet from the ground, and they become shorter and shorter as they are nearer the top. The leaves are divided into seven or nine lobes, about eighteen inches or two feet long, and are of a lively green. The tree bears male and female flowers, —the males among the upper leaves, and the females

at the extremities of the twigs. When full-grown, the fruit is about nine inches long, heart-shaped, of a greenish colour, and marked with hexagonal warts, formed into facets. The pulp is white, partly farinaceous and partly fibrous; but, when quite ripe, it becomes yellow and juicy. The whole tree, when in a green state, abounds with a viscid milky juice, of so tenacious a nature as to be drawn out in threads.

The bread-fruit tree continues productive for about eight months in the year. Such is its abundance, that two or three trees will suffice for a man's yearly supply, a store being made into a sour paste, called *mahe* in the islands, which is eaten during the unproductive season. When the fruit is roasted until the outside is charred, the pulp has a consistency not unlike that of wheaten bread, and the taste is intermediate between that of bread and roasted chestnuts. It is said to be very nourishing, and is prepared in various ways.

The timber of the bread-fruit tree, though soft, is found useful in the construction of houses and boats; the male flower, dried, serves for tinder, and the juice answers for bird-lime and glue; the leaves for packing and for towels; and the inner bark, beaten together, makes one species of the South-sea cloth.

The Jaca or Jack, which is represented in our woodcut, grows to the same, or even to a larger, size, than the bread-fruit of the Society Islands; but it is neither so palatable nor so nutritious. Though its specific name implies that it is entire-leaved, the leaves of it are sometimes found lobed, like those of the other. The fruit often weighs more than thirty pounds, and contains two hundred or three hundred seeds, each of them four times as large as an almond. December is the time when the fruit ripens; it is then eaten, though not much relished; and the seeds or nuts also are eaten, after being roasted. There are many varieties of the Jaca-tree, some of which can hardly be distinguished from the seedling variety of the true bread-fruit. The fruit, and also the part of the tree in which it is produced, varies with the age. When the tree is young the fruit grows from the twigs; in middle age it grows from the trunk; and when the tree gets old it grows from the roots.

MOHAMMEDAN SCHOOLS.

"KNOWLEDGE IS POWER," said one who knew in its fulness that power which knowledge gives; and we trust that it promises well and pleasantly for the future that this true and beautiful expression is, as a quotation, become hackneyed. In the same degree that knowledge is power, ignorance is weakness. Sorry are we to say that even in this country striking and painful evidences of the utter weakness of ignorance are not difficult to find: but, when they are found, other instances of the power and beauty of knowledge fail not to occur so soon after as to soften greatly the painfulness of the general impression. We thus become more reconciled to things as they are on the whole—more reconciled to the existence of ignorance, than we should be if we were to see the universal mind kept feeble by its weakness, and overshadowed by its gross darkness. *This* is seen in the East; and what the traveller sees there is calculated more than anything we know to impress upon him—not merely with the cool conviction of the understanding, but with the intensity of a feeling—how exceedingly pitiful and weak ignorance is; and, therefore, how strong and beautiful is knowledge. Among savage people this is never felt. *Their* modes of life and habits of thought and feeling are so entirely different, as to carry them out of that condition in which we regard ignorance with pain. But the case is different with the nations of the East. They may be considered as civilized; they have colleges and schools; they have a literature; they even know that knowledge is power, and often eagerly seek for such as may be obtained which, however, is both scanty and bad. This will be shown by an account of the mode in which instruction is conveyed, in the common Mohammedan schools, with a particular view to the art of reading, as from the state of that art, which is simply a minister to knowledge, the general condition of knowledge itself will in the present instance be easily deduced. Our statement will be understood to be drawn up so as to be applicable on the whole to most Mohammedan countries, but with an especial regard to Persia,—the Moslem country in which education is more valued, and therefore more diffused than in any other. It will also include the Armenians, a Christian people who inhabit chiefly in the countries to which this statement refers, and who, as a people, exhibit a very strong sense of at least the usefulness of knowledge, and seek for it with an earnestness and zeal worthy of far better rewards than the East can give.

If the stranger in a Moslem country in passing through the streets is attracted, by a noise for which he cannot satisfactorily account, towards the building in which the school is held, he will, on looking in, probably see a long and narrow room, at one end of which is seated a man with a long beard*, while the sides are lined with little boys of various ages squatted upon their heels on the floor, which is generally covered with a thick mat, in addition to which those parents who can afford it provide their sons with a bit of carpet or felt in Persia, or with a cushion in Turkey, to place between them and the mat. Some of the elder boys go so far as to obtain a cushion to introduce between their backs and the wall, but this luxury is rather discountenanced by the masters as an encroachment on their own peculiar dignities. All the boys have their heads covered; but they are without their shoes, which are left near the door, so mingled, and so similar in shape and colour, that it would seem difficult for each to find his own; but, on the breaking up, every one seems to slip his feet into his own shoes, without any of that individual hesitation or general confusion which might be expected. When the boys are learning their lessons or repeating them to their master, they do so all at once, with a loud voice and with a continual see-saw of the body, without which movement they seem to conceive it impossible that anything can be learnt. The scene which this affords is exceedingly ludicrous to an European, particularly as the zeal of the learner is estimated by the loudness of his voice and the violence of his see-saw; and hence, when conscious of the approach of a person whom the master or pupils wish to impress with a favourable opinion of their application and progress, the noise in the schools, which may previously have sunk into a low hum, rises abruptly to the clamorous uproar of many voices. It seems that in reading all at once to the master, the elder boys, if the school is large, are expected to give some attention to the others near them. The master cannot in such a noise distinguish the individual accuracy of each reader; and his attention is therefore directed to observe that time is as nearly as may be kept by the voices, and, in some measure, in the motions also of the pupils. This object seems but poorly attained; but still the attempt so far succeeds, that there is a very sensible difference between the noise of the formal reading and that of the audible conning of the lessons. The style of reading, which this system produces, is most unnatural; being as different as possible from the inartificial tone of conversation. It is a drawling chant, uttered in a very loud voice. In the East, generally, the tone of the

* Schoolmasters retain their beards, even when whiskers only are sanctioned by general usage.

voice is very high, even in common conversation; but in reading it is raised to screaming. A recent traveller relates that some Arabs desired him to let them hear him read. He complied, on which they exclaimed, "You are not reading; you are talking!" The fact however is, that, except among those of the learned professions, few of those who have professedly learnt to read in the schools can or do exercise the acquirement in after life; and the few who remain actually qualified to read with facility, rarely do so without some stimulus, incomparably stronger than would be required in this, or perhaps any European country. After a residence of several years among Mohammedan people, the writer does not recollect more than three instances in which he has seen persons quietly engaged in reading a book to themselves, although all the actions of their ordinary life are much more exposed to public notice than can be well imagined in this country.

These facts are easily explained. The want of the art of printing* renders books expensive articles of luxury in Mohammedan countries; and this is alone sufficient to account for much that we have stated. Before the introduction of that art, the state of knowledge among the people was not more favourable in this country than it is in Persia now,—perhaps, indeed, considerably less favourable. There is also another less obvious circumstance, which would have great influence even were manuscript books much more common and cheap than they are; this is, the difficulty of reading manuscript. This difficulty should not be underrated. Even in this country, most educated persons would require considerable stimulus to induce them to go through a manuscript volume. Those only whose duty it is to examine manuscripts, and to prepare them for the press, can describe the tediousness of the occupation. It is not one of the least advantages of printing that it has tended to simplify the character employed in the preparation of books, and to render it uniform. This comparison very imperfectly illustrates our meaning; for our manuscripts are far more legible to us than those of the East are to an Oriental. Among ourselves, many persons who can write short-hand with facility are unable to read it with ease; an Oriental manuscript is a sort of short-hand which many more persons are able to write than to read. The words are abbreviated, as in short-hand, by the omission of vowels; and when the words are decyphered, the want of punctuation renders it often difficult to discover at once the meaning of the phrases. When to this it is added that there are several different styles of writing, besides the difference occasioned in the several manuscripts by the variety of individual hands and flourishes; it will be perceived that a person cannot read with facility without more practice than the state of literature and knowledge encourages any considerable number of students to seek, or enables them to obtain.

A stranger is very liable to be deceived in estimating the competency of a Mohammedan to read. A very large part of a common education consists in learning by heart a very considerable portion of the current literature, particularly of the Koran. He is therefore able to repeat by rote the most striking passages of almost any of the very limited number of books which are likely to be placed before him. He will turn over its leaves until he can find some passage with which he is acquainted, and will repeat it correctly as if from the book; but if suddenly interrupted, he is afterwards quite unable to indicate the part of the page at which the interruption took place. The quantity of poetical literature with which the mind of a Persian is stored is perfectly amazing; and this alone suffices to show that books are scarce and reading difficult, while it also indicates what might be expected from them under a better system. As it is, the listening to tales and recitations delivered by persons who make it a profession, occupies, in some measure, the same place among Mohammedans as reading among ourselves; and any person is sure of an audience who sits down and professes his ability and willingness to afford amusement or instruction. In some places, indeed, there is no instruction, beyond that of reading and writing, to be obtained in any other manner than from persons who exhibit their information for the sake of the farthings which may be collected from the audience at the conclusion. In some towns men of professed learning are accustomed to go to the porch of the mosque and there begin to read, lecture, or preach to the people who collect around them; and it is not unusual for two persons to seat themselves opposite each other and instruct their auditors by a vehement dispute on any subject which they consider attractive. Such practices could only afford remuneration where there is a thirst for better knowledge than the ordinary channels of instruction afford. This thirst seems more intense in Persia than in any other Moslem nation. But all other Asiatic people, known to the writer, are exceeded in this by the Armenians, who have been led to feel very strongly the practical inutility of the instruction which the ordinary schools afford, and have therefore been induced to make greater efforts than any other people to obtain for their sons the benefit of a better system. For this purpose some of those who can afford it send their children, at a great expense, to a distant country, and maintain them there; while others anxiously endeavour to induce persons who have acquired a reputation as teachers to settle among them and undertake the instruction of their sons. The lads themselves have a strong feeling on the same subject; and when a little of true and quickening knowledge has been laid before them, they have displayed such docility, such patience, and such unwearied zeal, as has often moved the writer earnestly to hope that they might not much longer be shut out from the benefits which they have learned to value and desire. Meanwhile it may not be amiss to mention that they are the only people in Mohammedan Asia who have anything like a printed literature. They are supplied with printed books from presses established at the Armenian institution of St. Lazarus at Venice, at Vienna, in Russia, in India, and other parts. Many of these works are beautiful specimens of typography; and it may be interesting to add that they include translations of several English works, such as 'Paradise Lost' and 'Robinson Crusoe.'

When the Mohammedans are brought into contact with Europeans, it is impossible for them not to feel how immeasurably inferior they are to the latter in knowledge, and in that power which knowledge gives. To diminish the difference seems hopeless to them; and under the mortifying consciousness of their inferiority as a people, they often endeavour to console themselves by saying that it is "their fate." The Franks, they exclaim, have all their good things,—their knowledge and their power—in this life: but *they* shall have their own hereafter when the "Infidels" lie howling.

* It is scarcely worth while to mention the feeble operations of the press at Constantinople and in Egypt as exceptions.

Self-Lovers.—Extreme self-lovers will set a man's house on fire, though it were but to roast their eggs.—*Bacon.*

Wonders.—Men, till a matter be done, wonder that it can be done; and, as soon as it is done, wonder again that it was no sooner done.—*Bacon.*

THE BIRMINGHAM ORGAN.

[Grand Organ in the New Hall, Birmingham.]

A WOOD-CUT, with a description, of the Birmingham Music Hall, was furnished in No. 142 of the 'Penny Magazine,' and some mention was then made of the grand organ which occupies one end of that noble apartment. Before proceeding to give a more particular account of this already celebrated, though unfinished instrument, it will be useful to afford materials for comparison, by stating a few particulars concerning some other principal organs, referring to No. 161 for an account of that at Haarlem.

In the cathedral of Seville, in Spain, there is an organ with 100 stops, which comprise 5300 pipes. The organ at Goërlitz, in Upper Lusatia, has 82 stops, comprising 3270 pipes. That at St. Michael's, in Hamburg, has 67 stops (not 64, as stated by Burney), containing nine pipes of 16 feet, and three of 32 feet, with four rows of keys. It was erected at the cost of 4000*l*. At Weingarten, a Benedictine monastery in Suabia, there is an organ with 60 stops, which comprise 6666 pipes, seven of which are 16 feet high, and three 32 feet. It is stated that the monks were so delighted with this fine instrument, that they presented the builder, Gabelaar, of Ulm, with 6666 florins—a florin for each pipe—beyond the amount of his charge. The *old* organ at York was the largest in England; it had 52 stops, 3254 pipes, and three rows of keys. The largest organ at Rome is that in the church of St. John Lateran: it has 36 stops. There is one in the cathedral at Ulm that has 45 stops with 3442 pipes. At Baltimore, in the United States, there is an organ in the cathedral which has 36 stops, with 2213 pipes, the height of the largest of which is 32 feet.

It is usual, in describing an organ, to dwell particularly on the number of its stops; but, in point of fact, the number of the pipes is a more accurate criterion of the power of such instruments. Many of the organs on the continent, with such an imposing number of stops, are in actual power greatly inferior to others of much humbler pretensions. To complete this comparative statement, we may add, that the organs at Seville, Goërlitz, Merseberg, Hamburg, Weingarten, and Tours, are all larger than that of Haarlem; and that the new instruments at York and Birmingham exceed them all. It is still a disputed point which of the two latter is the largest, though the question would not seem to be very difficult to determine; but it is admitted that the pipes in the Birmingham organ are a trifle larger than in that at York; and from its situation in a noble room, built expressly for the purposes of music, and in which the volume of sound is not deadened, broken, or impeded by pillars and other obstructions, it possesses advantages which would enable a very ordinary instrument to compete, in fulness of effect, with the most powerful cathedral organs.

The width of the Birmingham organ is 35 feet; the depth 15, and the height 45. The swell-box, or receptacle for the pipes used for the swell only, is of the size of an ordinary church-organ. Although the instrument was employed at the late Musical Festival, it is still in an unfinished state: the number of pipes which will be placed in it cannot yet be exactly ascertained, but it will probably exceed that in any of the organs we have mentioned. The largest central pipe is 35 feet long, and rather less than 21 inches in diameter; but, of course, the sounding part of this pipe only extends 32 feet in length. The foot of this pipe is four feet in length, and weighs not less than 224 lbs. The metal pipes of large dimensions are made entirely of zinc. When the organ is finished, there will be about 60 *real* stops; but the *mixture* stops are not yet introduced. There are four rows of keys, and one extensive set of pedals, or foot-keys, and five common

bellows to give wind to the forest of pipes. In the swell-box a set of bells (*carillons*) has been placed, which appears to be a greater novelty than improvement; the effect produced is not good, and it would be well, perhaps, either to substitute larger bells or relinquish them altogether. By a remarkably ingenious mechanical contrivance, it is so arranged that all the various stops of the instrument may be combined on any one of the *claviers*, or sets of keys, by which the power of producing grand effects is almost infinitely extended.

In this organ there is a reed stop, called the *Posaune*, or trombone, which all who are acquainted with the organs of the continent consider to be the most powerful and the richest in tone of any existing. The powerful volume of sound proceeding from this stop is mingled with a mellowness which corrects the unpleasant impression which loudness occasionally produces. The assistance afforded by these pipes to the voices in the choruses cannot easily be estimated by those who have not heard it. It may fairly be stated that, while the *Posaune* renders the most effectual aid in blending the voices into one mass, it adds at least fifty per cent. to their power. This stop alone is sufficient to render the organ remarkable; and much of the superiority of the choral effects at the Birmingham Festival, above those produced at the recent commemoration in Westminster Abbey, is attributed to the power of this splendid stop.

The builder of this grand instrument is Mr. Hill, of London. The requisite funds were raised by subscription, and the expense is calculated at the very moderate sum of 2,000*l.*, which seems to indicate that the artist has rather sought reputation than pecuniary profit in his undertaking. The case of the instrument is from a design by Mr. Mackenzie, and perfectly harmonizes with the architectural style of the building in which it is placed. It is calculated that the timber alone employed in the construction of this organ would weigh between twenty and thirty tons, while the metal and other materials of the structure would raise the weight of the whole to at least forty tons.

DIFFICULTY OF SUPPLYING THE WANT OF EARLY EDUCATION.

[From a Correspondent.]

The 'Penny Magazine' has furnished several papers on the general subject of Education; but as I do not remember to have seen any individual case in its pages, I venture to communicate to you some points in my own history, which, if I am not mistaken, strongly illustrate the importance of acquiring, early in life, the fundamental knowledge which education supplies.

I think I may say that, in the whole of my life, I have never received any other direct and actual knowledge from others than such as a person necessarily, in his passage through life, gleans from those with whom he has intercourse. I was taught, indeed, to read and to write; but you are aware that reading and writing form no part of real knowledge, being simply acquirements—implements—with which, if we learn how to use them, some knowledge may be acquired and communicated. Poverty and great bodily infirmity concurred to stop my education at this point. Poverty required that I should early win my bread by the sweat of my brow; but my personal infirmities interposed, and procured me more leisure than a poor boy usually finds, and which I would then gladly have exchanged for the food and raiment which I might, under happier circumstances, have obtained by bodily labour.

My boyhood and my youth is now over, and, in reviewing my past career, I am sensible of many errors of conduct, and of many omissions of the duty which each man owes to himself; but in adverting to the particular period I have mentioned, I am at a loss to perceive how, under all the circumstances, I could better have employed the uncontrolled and unguided leisure of my boyhood than I did. During this period, and subsequently in the intervals of manual occupation, I read with eagerness every printed thing that fell in my way,—from the placard on the wall, and the torn newspaper gathered from the street, to volumes from the shelves of my neighbours—and from the nursery-book and the fairy-tale, to the poetry of Milton and the metaphysics of Locke. Thus, in the progress of years, I gathered together a considerable quantity of general knowledge, mixed with much rubbish and unprofitable matter. I gathered this knowledge together in solitude and silence, without the cognizance, direction, encouragement, or control of any living soul. I was even stirred by reading to think and to write for myself; and I acquired the power of expressing what I thought, or wished to state, just as I now express it to you. "Then you are a self-educated man?" No. I consider myself an uneducated man; and it is precisely my object to state that, while my actual acquirements have made happy and useful a life which once promised nothing of comfort or utility, I have suffered much from the want of that mental discipline in early life, and of those connected studies and regulated pursuits which form what I understand by the term "Education."

When I was at last brought by circumstances to mingle more with my fellows than I had hitherto done, I was soon enabled to discover that "knowledge was power." My situation was then such as to cause the amount of my attainments to be seen through a magnifying medium by myself and others; and by degrees I began to entertain the thought that I might one day inscribe my name among those which posterity would remember. But when I sat down quietly to consider the matter, I saw that to build up a structure in the world which I could myself regard with satisfaction, much was wanting which it did not seem likely that I should ever acquire.

Education was that which I wanted, and I perfectly well knew this want, and fully purposed to repair it to the best of my power; but I could not feel the prospect encouraging, that I should be obliged to spend the leisure of my best days, amidst the business and anxieties of mature life, in acquiring the routine and elementary knowledge with which others came into the active world ready furnished from their schools, and which had there formed the suitable employment of their unoccupied boyhood. In after years, I went on increasing my stock of actual knowledge, and supplying the want of early education, as well as my opportunities and means allowed; but, with regard to education, I found, in practice, that the business of self-instruction was too frequently interrupted by the attention which subjects of more immediate and important interest required; and I believe it will always be found a work of difficulty and self-denial to give the attention to the acquisition of the materials and elements of thought and knowledge when the mind has acquired maturity of action, and finds that its strength and vigour *might* have been much more fittingly employed in dealing with accumulated elements, and forming a superstructure on accumulated materials. The case is that of one who might be erecting a house in which men may dwell, or a temple in which they may worship, but is obliged to bore stone at the quarry, or make bricks in the field.

I am anxious to be distinctly understood. It may be said, "Many are obliged to learn things which they ought to have learnt at school: there is Mr. A——, who is now, at the age of 40, learning Greek." Now, I will not stop to ask whether Mr. A—— might not, at the age of 40, be better employed than in

learning Greek; but I would say that this case, or any such case, has nothing at all to do with the subject before us. An educated man may, with facility and interest, study a language or a science, the process of acquiring which would be tiresome and difficult to one who is uneducated. The former has habits of connected study which facilitate his progress; and the languages or sciences with which he is acquainted suggest analogies and differences, elucidate obscurities, and, altogether, greatly enliven his progress in the acquisition of a new science or a new language. The educated and uneducated man may, at the same time of life, be apparently occupied in the same pursuit; but the actual difference between them is incalculable. The one is working lightly to place a turret upon the tower he built up in his youth, while the other is digging, with great labour, in a stubborn soil, the foundations of a prospective structure.

It was thus that I soon learned to feel the position which I occupied, and was led, on consideration, to think, that to acquire a routine education would exclusively occupy the leisure of more years than the shortness of active life would authorize me to spare; and that I could not, under all the circumstances, do better than to continue to accumulate that general information which is not science, or learning, or education, but yet is something of all. I really think, at this day, that I could not have arrived at a better conclusion: if I had determined otherwise, my education would still be far from completion, and I should have wanted some practical habits and attainments which I am enabled to turn to useful account, and which will, I trust, mark my existence as one that has not been spent in vain. Through the habits of mind which I have been enabled to form, in spite of the want of education, my life has been rendered comfortable. I can obtain the means of satisfying all my reasonable wants; I have many friends, and never had a foe; and those with whom I am in duty or in friendship connected seem to award me quite as much consideration as I feel entitled to expect. And yet, with all this, the want of education has exposed me to drawbacks and mortifications which make me often feel as if I were an intruder on the position to which I have attained; and I am perfectly assured that if I could impress my convictions as strongly as I entertain them upon the mind of a parent or a child, nothing would appear to them more important than the habits which early education produces, and the fundamental acquirements which it bestows.

I think I have said that at the time when I knew little, practically, of myself or of others, fame appeared to me as a primary object of existence. But my young ambition, in the course of following years, spontaneously moulted many of its plumes, and many others were roughly torn off in my passage through the world. Time and experience rendered my character less sanguine than it had been; the cares and duties of life gathered around me, and I became acquainted with men whom I could at once acknowledge as much superior in natural and acquired power to myself. These things brought me down to my true position, and taught me to be content to be quietly and unobtrusively useful; and, ultimately, the desire to be useful became to me nearly as strong a principle of action as the desire of distinction had formerly been.

Yet the comparative moderation of my present objects does not exempt me, as I have intimated, from much cause to regret the want of early education. And this want I have now no expectation ever to repair; for the time is come when I must live upon what I have already done, and my time is of too much immediate value to allow me to do much more. In this great city I have found my level, as most other men find theirs. That level is an eminence compared with my early prospects; but, circumstanced as I now am, the limit of my usefulness is the limit of my ascent; and I am connected with those who hold a man in consideration less in proportion to the difficulties he has overcome, than according to the actual and practical amount of his usefulness and talent. Now, education is a most important—almost an essential—element of the usefulness of a civilized man to the world, and to the circle which time gathers more immediately around him; and while I am perfectly content, and even happy, in my actual position, in which all the real abilities I may possess are well employed and well recompensed, I never had occasion to feel more intensely all the advantages which education bestows, and never perceived so clearly to what excellent account these advantages might be turned. There are also in such a condition many mortifications, one of which it may be worth while to mention. When a person hears that another had not the advantages of education and yet is of studious habits, he takes it for granted that he has rendered himself an educated man, without considering that it is as probable—perhaps more probable—that he employs himself on things which form no part of education, and which the educated man adds to his education. Hence the uninstructed student is often inconsiderately asked, by persons who are not well acquainted with him,—how many languages and sciences he knows?—an astounding question, the answer to which must make the inquirer feel that the talents and acquirements of the person whom he questions had been immensely exaggerated, if he forgets that while many school-boys know more than he, many men who have been school-boys know less.

I could say much more on this subject, but I have said as much as I desire if I have shown the importance of early education, by exhibiting the great difficulty of supplying the want in after life, and the disadvantage of leaving it unsupplied.

Cleanliness.—The frequent use of the bath, and scrupulous attention to cleanliness, are among the surest means of restoring health to those who are sick, and securing it to those who are well. It is an astonishing fact that few countries in the world are so badly supplied with proper bathing-places as England, and that (taking the people in the mass) there are few among whom the use of the bath is less general than among the English. And yet we consider ourselves, and, indeed, especially pride ourselves on being a very cleanly people. We suspect there is some truth in a sarcastic remark which we met with a few years ago—"A Frenchman in the middling ranks of life often puts on a dirty shirt over a clean skin, but an Englishman of the same condition still oftener puts on a clean shirt over a dirty skin." The extravagant price paid even in London for a bath, is proof enough that the use of it is very confined. If it were more general, there would be a competition of speculators in that line, and the number of baths would be increased, and the prices lowered. As less is paid for a bath now than was paid in 1815, we may perhaps conclude that there are more bathers than formerly, and that the salutary practice is rather on the increase among us. Before the last peace, there were few of our provincial towns that had public baths of any kind, and in many of the northern parts of the island no such vessel as a bath had ever been seen. To speak of London alone, with its admirable supply of water and fuel, with the ingenious contrivances lately invented to economize fuel, and generate and diffuse heat at small expense, we think it might be practicable to let the poor man have his bath for two or three pence. Indeed, there can be no doubt but that it would be practicable, if the purifying and most salutary practice of bathing were to become general among the people. If the working classes were once tempted by low prices, we think it pretty certain that they would contract the habit to such an extent as to make low prices pay those who should speculate in such establishments.—*Quarterly Journal of Education, No. XVI.*

THE MENAI SUSPENSION-BRIDGE.

The most obvious and simple bridge is that formed by single trees thrown across small streams, or, in case of broader streams, by fastening the roots of a tree on each bank, and twisting together their branches in the middle. The next step is not much more complex; for in a space too great for the before-mentioned operations, few manual arts were required to form ropes of rushes, or leathern thongs, to stretch as many of them as were necessary between trees, or posts, on the opposite banks, and connect and cover them so as to form a slight bridge. The following accounts, given by Don Antonio de Ulloa, will afford a notion how these sorts of bridges were constructed and used in the mountainous parts of South America:—"Several bujucos are twisted together, so as to form a large cable of the length required. Six of these are carried from one side of the river to the other, two of which are considerably higher than the other four. On the latter are laid sticks in a transverse direction, and, over these, branches of trees as a flooring; the former are fastened to the four which form the bridge, and by that means serve as rails for the security of the passenger, who would otherwise be in no small danger from the continual oscillation." A sketch will be found in No. 10 of the 'Penny Magazine' of a bridge of this description. "Some of the rivers," says the same author, "are crossed by means of a tartabita. The tartabita is only a single rope, made of bujuco, or thongs of an ox's hide, and consisting of several strands, and about six or eight inches in thickness. This rope is extended from one side of the river to the other, and fastened on each bank to strong posts. From the tartabita hangs a kind of leathern hammock, capable of holding a man; and a clue is attached at each end. A rope is fastened to either clue, and extended to each side of the river, for drawing the hammock to the side intended. On one of the banks is a kind of wheel, or winch, to slacken the tartabita to the degree required; and the hammock being pushed on first setting off, is quickly landed on the other side. For carrying over the mules two tartabitas are required, one for each side of the river, and the ropes are much thicker and slacker. The animal being secured with girths round the belly, neck, and legs, is launched in mid-air, and immediately landed on the opposite bank. In this manner rivers are crossed between thirty and forty fathoms from shore to shore, at a height above the water of twenty-five fathoms." In China and Thibet there were, at an early period, suspension-bridges formed by cables of vegetable substances; but the nations of the East, after having, in the earliest times, made astonishing progress, stopped all at once in their march.

Suspension-bridges were not considered applicable to the purposes of a commercial country until within a comparatively recent period. They had been superseded by substantial structures, in which utility was joined to magnificence; but these, as they could not always be carried over turbulent streams, did not satisfy the ever-active wants of an industrious people. About a century ago, a bridge of iron-wire was suspended over the Tees, at Winch, near Durham, which served for foot-passengers. The principle of suspension-bridges was naturalized in England, but their utility was not in reality much greater than the frail constructions of South America, or Eastern Asia. "It was just," observes Dupin, "that this noble application of art should be first adopted on our continent by the nation which had surpassed all others in the execution of those great works in which iron was the principal element;" and there now only required minds whose genius was fitted to direct the suspensive principle of bridge-building on a scale commensurate to the wants of the time. These soon arose: the Menai Bridge is one of the most magnificent specimens of engineering talent yet in existence. It was constructed under the directions of the late Mr. Telford. In 1818, this gentleman was surveying the improvements which could be effected on the extensive line of roads from London to Holyhead, —the point of the Welsh coast nearest to Ireland. Holyhead is situated in the island of Anglesea, which is separated from Caernarvonshire by a celebrated strait, or arm of the sea, named the Menai, through which the tide flows with great velocity, and, from local circumstances, in a very peculiar manner. The intercourse of the inhabitants with the opposite portion of Wales was thus circumscribed. There were five or six ferries, but the navigation was often difficult, and sometimes dangerous. One of the staple productions of the island is cattle, and they were generally compelled to swim across the Strait. The importance of obtaining more rapid means of intercourse with Ireland occasioned Mr. Telford strongly to direct his attention to the possibility of throwing a bridge across the Menai. The obstacles were a rapid stream with high banks. To have erected a bridge of the usual construction would have obstructed the navigation; besides, the erection of piers in the bed of the sea was impracticable. Mr. Telford therefore recommended the construction of a suspension-bridge, which was completed in 1826. "The bridge is partly of stone and partly of iron, and consists of seven stone arches, exceeding in magnitude every work of the kind in the world. They connect the land with the two main piers, which rise 53 feet above the level of the road, over the top of which the chains are suspended, each chain being 1,714 feet from the fastenings in the rock. The top-masts of the first three-masted vessel which passed under the bridge were nearly as high as those of a frigate, but they cleared twelve feet and a half below the level of the roadway. The suspending power of the chains is calculated at 2,016 tons; the total weight of each chain is 121 tons.

"This bridge occasioned Mr. Telford more intense thought than any other of his works. To a friend, a few months before his death, he stated that his anxiety for a short time previous to the opening was so extreme that he had but little sound sleep; and that a much longer continuance of that condition of mind must have undermined his health. Not that he had any reason to doubt the strength and stability of any part of the structure, for he had employed all the precautions that he could imagine useful, as suggested by his own experience and consideration, or by the zeal and talents of his able assistants, yet the bare possibility that some weak point might have escaped his and their vigilance in a work so new, kept the whole structure constantly passing in review before his mind's eye, to examine if he could discover a point that did not contribute its share to the perfection of the whole*."

The idea and execution of chain suspension piers is due to Captain Brown. They are of great value in ports where ships are unable to approach the shore for a considerable distance, in embarking or disembarking troops and baggage, and in facilitating the arrival and departure of passengers. The chain-pier at Leith was constructed by Captain Brown in 1822. In order to reach, from the shore, the place in the Forth where steam-boats and other ships could keep afloat at high or low water without danger, and in very bad weather, it was necessary to advance 233 yards into the sea, reckoning the distance from the high-water mark on shore. To fill up this long space, three arches of suspension chains were formed, each having 209 feet in span; thus the pier is held by four supports only,—one on shore, and three upon piles in the middle of the sea. In order to try the power of the chain-pier,

* 'Repertory of Arts' for October, 1834, to which article we are also indebted for some of the subsequent details.

Captain Brown loaded it with 210 tons which he suffered to remain a considerable length of time, notwithstanding the casual burden occasioned by passengers, and the shaking produced by their movement. Such a fact affords a satisfactory proof of the solidity of the system on which the pier was constructed. The Brighton chain-pier is on a larger scale than that at Leith, being composed of three inverted arches, each 230 feet in span; its breadth is 12 feet.

In France it has been proposed to convey water across narrow and deep valleys by suspension canals, instead of those aqueducts with lofty stone arches, which are so expensive in their construction. On the estate of M. de Chabrol, there is a small aqueduct of one pipe supported by suspension chains.

Mr. Telford, the engineer under whose directions the Menai Bridge was constructed, was unequalled in this or any other country for the number and importance of his public works. There is scarcely a county in England, Wales, or Scotland, in which they may not be pointed out. The Conway Bridge, the Caledonian Canal, the St. Katherine's Docks, the Holyhead roads and bridges, the Highland roads and bridges, the Chirke and Pont-y-cisilte aqueducts are the works of his genius and ability. The Menai Bridge will probably be regarded as the most striking monument of his fame. In the construction of the Caledonian Canal he successfully contended with immense obstacles; but he was accustomed to set a higher value on the improvements which he effected on the Holyhead Road than on any other of his works. Mr. Telford was born in the parish of Westerhill, in the county of Dumfries, in the year 1757. At the age of fourteen he was apprenticed to the trade of a mason, and, until 1783, he continued to be employed in house and bridge building in his native district of Eskdale. Having then been taught architectural drawing he came up to London, and was for some time employed at the great square of public-offices at Somerset House: gradually he rose from the stone-mason and builder's yard to the head of his profession. Though all his conceptions were vast, yet to magnificence he knew how to join beauty and elegance. When at the highest point of his fame, his conduct towards the junior members of his profession was marked by great kindness and liberality, and to the latest period of his life he was fond of the society of young men who delighted in learning, encouraging them to pursue their studies in the manner best calculated to insure eminence in their respective avocations. He was a great reader, and by self-instruction acquired a knowledge of Latin, German, French, and Italian. He generally retired to bed before twelve, and read himself to sleep; rose at seven, and finished breakfast before eight, at which hour he entered his office for business; and to his punctuality he no doubt owed some of his great success in life. Mr. Telford was never married. For some time he had been gradually withdrawing from his professional duties, and chiefly occupied himself in preparing a detailed account of the great works which he had planned and lived to see executed. The writer in the 'Repertory of Arts' states, that the manuscript of this work was completed a few years before his death, which took place on the 2nd of September, 1834; and on the 10th his remains were deposited in Westminster Abbey. Like Arkwright and Watt, his genius was one peculiarly adapted to the country of his birth; like them he added to its resources, and increased the means of its wealth and happiness.

[Menai Bridge.]

*** The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's Inn Fields.
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